We wish to submit the following for presentation at the Laser Optics '93 Condference.

Data Analysis for GOPEX Laser Communications Experiment

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Abstract

This paper describes the data analysis based on the image frames received at the Solid State imaging (SS1) camera of the Galileo Optical-communications from an Earth-based Transmitter (GOPEX) demonstration conducted between December 9 and December 16 of 1992. Laser uplink was successfully established between ground and the Galileo spacecraft during its second earth gravity assist phase. SS1 camera frames were acquired which contained images of detected laser pulses transmitted from the Table Mountain Facility (TMF), Wrightwood, California, and the Starfire Optical Range (SOR), Albuquerque, New Mexico. Laser pulse data were first processed using standard image processing techniques for preliminary pulse identification, and to produce public release images. Subsequent image analysis corrected for background noise and measured received pulse intensities. Data were plotted to obtain histograms on a daily basis, and were then compared to theoretical results derived from applicable weak turbulence and strong turbulence considerations. This paper describes processing steps and provides a comparison of the theories to the experimental results. Quantitative agreement was found in both turbulence regimes.